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ABSTRACT

This selection of four brief papers published by the Environmental Simulation Laboratory, University of Michigan, lists the names, pertinent information and sources of some 50 gaming/simulations. Information on miscellaneous Environmental Simulation Laboratory publications, a history of the Laboratory, an appendix listing other games and sources, and a detailed description of the METRO-APEX game, including some suggested reference books for use during play of METRO-APEX, are also provided. (LK)

ED 067228

SCHOOL OF NATURAL RESOURCES THE UNIVERSITY OF MICHIGAN

ENVIRONMENTAL SIMULATION LABORATORY
RICHARD D. DUKE, DIRECTOR

109 E. MADISON
ANN ARBOR, MICHIGAN 48104

# A SELECTED LIST
# OF URBAN AND ENVIRONMENTAL GAMING/SIMULATIONS

Prepared July, 1972 at the: Environmental Simulation Laboratory
The University of Michigan
109 E. Madison
Ann Arbor, Michigan 48104
(313)-763-0258

We of course do not intend this list to be definitive, but do hope it will be useful as a starting point for obtaining further information about specific games. We have tried to omit gaming/simulations we do not consider useful for some educational purpose, as well as those which do not focus on one or another "social concern."

We often are asked which age group a particular game is best suited for. One of the beauties of games is that they are, as the advertiser likes to say, "suitable for all ages" -- at least junior high and up. In fact, we find that young people play more easily and more fully, willing to experiment and less inhibited as they are.

Nevertheless, we have omitted from our list those designed principally for use within the classroom situation (including a number of "history" games), but have appended an (incomplete) list of sources of brochures on games specifically for elementary and high school people. The "Appendix" also contains a very few other sources of game information.

*An asterisk before a game indicates that detailed information about it may be obtained from the Environmental Simulation Laboratory. Please consult the Publications List for cost, if any. Further information about other games should be requested from the distributor and/or game developer.

ESL staff is prepared to run its gaming/simulations and some of the others under certain circumstances for a negotiable fee.

Barbara Steinwachs

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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I. Developed by Staff of Environmental Simulation Laboratory

II. Developed by Other University of Michigan Divisions

III. Distributed through Instructional Simulations, Inc.

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# A SELECTED LIST
# OF URBAN AND ENVIRONMENTAL GAMING/SIMULATIONS

## I. DEVELOPED BY STAFF OF ENVIRONMENTAL SIMULATION LABORATORY

*CLUG (Community Land Use Game)
urban and regional economics

Developed by: Allan G. Feldt
Players: about 15
Time: 6 hr. or, preferably, longer

Player's Manual ($4.95) with basic model, experiments (variations), and readings; and Instructor's Manual (gratis) with simple playing pieces publ. 1972 by:
The Free Press
Department F
Riverside, N. J. 08075

Complete kit ($75) available from:
Urbex Affiliates, Inc.
474 Thurston Road
Rochester, New York 14619

FORAM: See "ORAM," below.

*Housing Plan (also see Section IX)
low-and-moderate-income housing

Developed by: Larry C. Coppard & Mary K. Naulin
Players: 10-30
Time: 4 hr.

For further information about the game and/or a run of the game, contact:
Environmental Simulation Laboratory
University of Michigan
109 E. Madison
Ann Arbor, Michigan 48104

*M.E.T.R.O.-APEX: See Section IX.

*Metropolis: See Section IX.

ORAM
generalized framework describing basic structure of this family of games

Developed by: William Liggett & Allan Feldt

FORAM (Forest Optimal Resource Allocation Management)
use of national forest resources

Developed by: William Liggett and Robert Shackelford

Full instructions ($4.00 for each) available from:
Environmental Simulation Laboratory
University of Michigan
109 E. Madison
Ann Arbor, Michigan 48104

SLORAM (Shore Line Optimal Resource Allocation Management)
use of shorelines (with high recreational value) in less populated areas

Developed by: William Liggett and Peter Reiner
Players: 7 (several games may be run simultaneously)
Time: 2-3 hr.

*PPOM (Population Policies Orientation Model)
state and national planning with respect to economic, demographic, social, and political development

In process of development by: Allan G. Feldt
Players: 15-30 optimum
Time: 4-6 hr.

Not yet available

SLORAM: See "ORAM," above.

*W.A.L.R.U.S. I (Water and Land Resource Utilization Simulation)
impact of public and private decisions on water pollution

Developed by: Allan G. Feldt & David Moses
Players: 15-30 optimum
Time: 4 hr.

Complete description ($3) from:
Sea Grant Advisory Services
1101 N. University Bldg.
University of Michigan
Ann Arbor, Michigan 48104

Complete kits ($75) available from:
Urbex Affiliates, Inc.
474 Thurston Road
Rochester, New York 14619

*WARD
community development and housing improvement

Developed by: Larry C. Coppard & Marilyn Miller
Players: 10-50
Time: several 3-hr. sessions

For further information about the game and/or a run of the game, contact:
Environmental Simulation Laboratory
University of Michigan
109 E. Madison
Ann Arbor, Michigan 48104

## II. DEVELOPED BY OTHER UNIVERSITY OF MICHIGAN DIVISIONS

COMPACTS (Community Planning and Action Simulation)
urban social service system

Developed by: Armand Lauffer
Players: 20-60
Time: 3 hr.-3 days

Complete kit available from:
Robert Wesner
c/o Random House
201 E. 50 Street
New York, New York 10022

Extinction
evolution and survival or extinction of species

Developed by: Stephen P. Hubbell
Players: 3-4
Time: 3 hr. or more

Complete kit ($11) available from:
Sinauer Associates, Inc.
20 Second Street
Stamford, Connecticut 06905

*Policy Negotiations
a priming game on allocation of influence in the decision-making process
N.B. Modification (to subject matter of interest to group playing) integral to game

Developed by: Fred Goodman
Players: 6-10 optimum (more possible)
Time: Priming Game: 2-3 hr.
Re-design Time: 1-many hr.
Re-play Time: 2-3 hr.

Complete kit (about $50) available from:
Learning Activities & Materials
c/o Fred Goodman
School of Education Building
University of Michigan
Ann Arbor, Michigan

*SIMSOC (Simulated Society)
the establishment and maintenance of social order

Developed by: William A. Gamson
Players: 20-50
Time: 6-8 1-hour sessions

Player's Manual ($4.95) and Instructor's Manual (gratis) available from:
The Free Press
Department F
Riverside, N. J. 08075
(Forms Included)

*They Shoot Marbles, Don't They?
societal analysis

Developed by: Fred Goodman & Bob Parnes
Players: 8-50 (15-25 optimum)
Time: 2 1/2 hr or more

For directions and/or most up-to-date information, contact:
Learning Activities and Materials
c/o Fred Goodman
School of Education Building
The University of Michigan
Ann Arbor, Michigan

Complete kit ($40) available from:
Urbex Affiliates, Inc.
474 Thurston Rd.
Rochester, New York 14619

III. DISTRIBUTED THROUGH INSTRUCTIONAL SIMULATIONS, INC.

Campaign
state legislative race

Players: 23-40
Time: 10-12 hr.

Complete kit ($125) available from:
Instructional Simulations, Inc.
2147 University Avenue
St. Paul, Minn. 55114

F.L.I.P. (Family Life Income Patterns)
family budgeting, investment, credit and interest in terms of changing family goals

Players: up to 30
Time: 2-8 hr.

Complete kit ($34) available from:
Instructional Simulations, Inc.
2147 University Avenue
St. Paul, Minnesota 55114

Impact
community action in problem-solving situations

Players: 20-35
Time: 8-10 hr.

Complete kit ($160) available from:
Instructional Simulations, Inc.
2147 University Avenue
St. Paul, Minnesota 55114

Tracts
Core city land use

Players: 12-35
Time: 2-4 hr.

Complete kit ($39) available from:
Instructional Simulations, Inc.
2147 University Avenue
St. Paul, Minnesota 55114

IV. DISTRIBUTED THROUGH PSYCHOLOGY TODAY

Blacks and Whites
racial conflict

Players: 3-9
Time: 1-2 hr.

Complete kit available in your local bookstore and/or department store, or from:
Psychology Today Games
Del Mar, California 92014

Cities Game
urban tension and negotiation

Players: 4-16
Time: 1-2 hr.

Complete kit available in your local bookstore and/or department store, or from:
Psychology Today Games
Del Mar, California 92014

V. DEVELOPED BY AND/OR DISTRIBUTED THROUGH URBANDYNE

Edge City College
strategies and processes of a college or university

Players: 15-30
Time: 3-4 hr.

Complete kit ($30) available from:
Urbandyne
5659 South Woodlawn Avenue
Chicago, Illinois 60637
(312)-955-9089

SLUDGE
environmental pollution

Players: 15-25

Complete kit available from:
Urbandyne
5659 S. Woodlawn Avenue
Chicago, Illinois 60637
(312)-955-9089

Urban Dynamics
basic structures & interlocking systems in the growth and development of a metropolitan area

Players: 12-20
Time: 4 hr. or more

Complete kit ($95) available from
Urbandyne
5659 S. Woodlawn Avenue
Chicago, Illinois 60637
(312)-955-9089

Audio visual package on game introduction and de-briefing also available ($15)

Youth Culture Game
"a total environment improvisational theater game"

Players: 20-80
Time: 2 hr.

Complete instructions ($15) available from:
Urbandyne
5659 S. Woodlawn Avenue
Chicago, Illinois 60637
(312)-955-9089

VI. DEVELOPED BY WESTERN BEHAVIORAL SCIENCES INSTITUTE
Descriptive catalogues available on request from:
Simile II
P. O. Box 1023
La Jolla, California 92037

Crisis
international conflict

Players: 18-36
Time: 2-4 hr.

Sample set ($3)
Student kit ($35 or $50)
available from Simile II

Metropolitics
varying types of metropolitan government

Players: 18-35

Sample set ($3)
Complete kit ($25)
available from Simile II

Napoli (NAtional POLItics)
legislative process and representative nature of democracy

Players: 8-36
Time: 2-4 hr.

Sample set ($3)
Student kit ($35 or $50)
available from Simile II.

Plans
conflicting interest groups attempt to change American society

Players: 12-36
Time: 3-8 hr.

Sample set ($3)
Student kit ($35 or $50)
available from Simile II

Sitte
conflicting interest groups work to change a city

Players: 10-30
Time: 2-4 hr.

Sample set ($3)
Student kit ($35 or $50)
available from Simile II

Starpower
the uses of power

Developed by: R. Garry Shirts
Players: 12-24
Time 1-3 hr.

Directions ($3)
Student kit ($25)
available from Simile II

VII. DISTRIBUTED THROUGH WESTERN PUBLISHING CO., INC.

Democracy
representative government
(legislative process):
composite of 8 different games

Players: 6-11
Time: 1/2 - 4 hr.

Complete kit ($6.50)
available from your local
bookstore and/or department
store, or from:
Western Publishing Co., Inc.
School and Library Department
850 Third Avenue
New York, New York 10022

Ghetto
problems of the urban poor

Developed by: Dove Toll
Players: 7-20
Time: 1 hr. or more

Complete kit ($20)
available from:
Western Publishing Co., Inc.
School and Library Department
850 Third Avenue
New York, New York 10022

VIII. Miscellaneous

Consensus
presidential electoral strategy

Developed by: John Reed Koza
Players: 2-4
Time: 1 hr. 15 min.

Complete kit ($7.95) available
from:
Scientific Games Development Corp.
Box 427
Ann Arbor, Michigan 48107

Dirty Water
water pollution and ecological balance

Developed by: Judith Anderson, Helen
Trilling, Roger Moody, Rich Rosen
Players: 2-4
Time: 1-2 hr.

Complete kit ($10) available
from:
Urban Systems, Inc.
1033 Massachusetts Avenue
Cambridge, Massachusetts 02138

Election
democratic process and presidential
elective system
(1-9 games)

Developed by: Joseph Young
Players: 4
Time: 30-60 min.

Complete kit ($5.35 each)
available from:
Educational Games Co.
Box 363
Peekskiil, New York 10566

Future
cross-impact of possible future developments

Developed by: Olaf Helmer, T. J. Gordon, Hans Goldschmidt
Players: 4-12
Time: 1 hr.

Kits are currently "out of print." For information contact:
Olaf Helmer and Theodore Gordon
Institute for the Future
Middletown, Connecticut

Lobbying Game
lobbying process in state legislature

Developed by: David Williams and Stanley Blostein
Players: 22-34
Time: 2 hr.

Complete kit ($45) available from:
Games Group II
P. O. Box 2088
Brandeis University
Waltham, Massachusetts 02154

New Town
new community development

Developed by: Barry Ross Lawson
Players: 7-10
Time: 3-4 hr. or more

Kits at varying levels of complexity available from:
Harwell Associates, Inc.
Box 95
Convent Station, New Jersey 07961

The Poverty Game
the dynamics of poverty in affluence

Developed by: Jim Egbert
Players: 10 or more
Time: less than 1 hr.

For directions, contact:
Jim Egbert
Pilgrim United Church of Christ
4418 Bridgetown Road
Cincinnati, Ohio 45211

Square Mile
land development

Players: 2-4

Complete kit available from:
Milton Bradley Co.
Springfield, Massachusetts

## IX. COMPUTERIZED GAMING/SIMULATIONS

City I
economic, political, and social interaction towards a developing city

Developed by: Peter House
Players: 25-100
Time: 1 day or more
Computer Needed: IBM 1130 (min. 8K core storage, single disk drive)

Although a workable game of substantial quality and character, City I is not available through any formal distribution mechanism. Universities known to be using the model in some form are, among others:
Howard University (Washington, D.C.)
University of Michigan (Ann Arbor)

*Housing Plan (See Section I)

Computer Needed: IBM 360

Program unavailable at present time

*M.E.T.R.O.-APEX
physical and economic development of a metropolitan area, with emphasis on air pollution control

Developed by: staff of Environmental Simulation Laboratory
Players: 30-60 optimum, but fewer or more ok
Time: several cycles of 4-5 hr. each.
Computer Needed: IBM 1130 (min. 8K core storage, single disk drive) or 360 (min. 360/40; 256K, but 128K is possible).

Manuals, user forms, ~~and~~ computer program ~~tentatively~~ available from:
Environmental Protection Agency
Charles Pratt
Office of Manpower Development
Office of Air Programs - EPA
P. O. Box 12005
Research Triangle Park, North Carolina 27711
(919)-549-8411
or from:
Environmental Simulation Laboratory
University of Michigan
109 E. Madison
Ann Arbor, Michigan 48104
CONTACT EITHER SOURCE REGARDING PURCHASE COSTS.

from: John Daisinger
ERIC/ SMEAC
c.1150 1460 W. Lane Ave.
Columbus, Ohio 43210
614-422-6717

*Metropolis
metropolitan growth and development, with emphasis on capital budgeting and public expenditure

Developed by: Richard D. Duke
Players: 9 is best for one game; 2 or 3 games ("cities") can be run simultaneously
Time: several cycles of about 1 hour each
Computer Needed: at present, IBM 1130 (min. 8K core storage, single disk drive)

Manual will be available by Fall 1972 from Environmental Simulation Laboratory. Computer program ($100; additional charge for one disk) available now from ESL.

River Basin Model
an extension of City IV (see City I above), this version is based on a large city and its surrounding watershed

Developed by: Peter House and Staff
Players: 20-120
Time: 1 day or, preferably, longer

For further information regarding the gaming/simulation or a run of it, contact:
Environmental Protection Agency
Environmental Studies Division
Washington, D. C. 20460
or, preferably, one of the universities listed below.

One University in each of ten federal regional districts in the United States is disseminating information about the River Basin Model. They are:

REGION I (Maine, N.H., Vt., Mass., Conn., R.I.):
John W. Sommer/Dept. of Geog./Dartmouth College/Hanover, N.H./(603)-646-3117

REGION II (N.Y., N.J., Virgin Islands, Pureto Rico)
Prof. Myron Uretsky/New York Univ./Graduate School of Business Administration/100 Trinity Place/New York, New York 10006/(212)-732-5820

REGION III (Pa., Md., Del., W. Va., Va.):
W. L. Garrison/Environmental Systems Engineering/School of Engineering/University of Pittsburgh/Pittsburgh, Pa. 15213/(412)-621-3500 x6338

REGION IV (Ky., Tenn., N. C., S.C,, Ga., Ala., Miss., Fla.):
Michael D. Kennedy/College of Architecture/Pence Hall/University of Kentucky/Lexington, Ky. 40506/(606)-257-1881

REGION V (Ohio, Ind., Ill., Mich., Wisc., Minn.):
Allan G. Feldt/Environmental Simulation Lab./University of Michigan/109 E. Madison/Ann Arbor, Mich. 48104/(313)-763-0258

REGION VI (Ark., La., Tex., Okl., N. Mex.):
Luis H. Summers/University of Oklahoma/180 West Brooks St./Room 252/Norman, Okl. 73069/(405)-325-5761

REGION VII (Iowa, Mo. Kans., Nebr):
Gerald L. Esterson/Dept. of Chemical Engineering/School of Engineering and Applied Science/Washington University/St. Louis, Mo. 63130/(314)-863-0100 X4017

REGION VIII (N. Dak., S. Dak., Mont., Wy., Col., Utah):
Dr. Leon Osterweil/Dept. of Computer Science/University of Colorado/Boulder, Col. 80302/(303)-443-2211 X6902

REGION IX (Ariz., Nev., Ca., Hawaii, Guam):
Dr. Stephen F. McCormick/Institute for Educational Computing/Claremont Colleges/McConnell Center/Pitzer College/Claremont, Ca. 91711/(714)-626-8511 X3312

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REGION X (Idaho, Wash., Oreg., Alaska):
Dr. Edgar M. Horwood/Departments of Urban Planning and Civil Engineering/Urban Transportation Program, FV-10/University of Washington/Seattle, Washington 98195/ (206)-543-7331

# APPENDIX

I. The second (revised) edition of the annotated (and rather complete) Guide to Simulation Games for Education and Training (Zuckerman and Horn, ed.) may be obtained for $15 from Information Resources, Inc./P.O. Box 493/ Lexington, Mass. 02173.

Werner and Werner's Bibliography of Simulations: Social Systems and Education (Western Behavioral Sciences Institute/1150 Silverado/La Jolla, Ca.) is a very complete book and periodical listing, but through Jan. 1969 only. 178 pp. $4.00.

II. Some Sources of Games for Elementary and High School Use

A. From those already listed

Educational Games Co. (Section VIII)
Jim Egbert (Section VIII)
Harwell Associates, Inc. (Section VIII)
Instructional Simulations, Inc. (Section III)
Simile II (Section VI)
Urban Systems, Inc. (Section VIII)
Urbandyne (Section V)
Western Publishing Co., Inc. (Section VIII)

B. A few others

ABT Associates, or Games Central/55 Wheeler St./Cambridge, Mass. 02138
Environmental Design/P.O. Box 683/Chatsworth, Ca. 91311
Interact/P.O. Box 262/Lakeside, Ca. 92040
The Macmillan Co. - School Division Dept. SNY/Riverside, N.J. 08075
Science Research Associates, Inc./259 East Erie St./Chicago, Ill. 60611

III. A wide variety of games for specific (and sometimes limited) purposes has been designed by ABT Associates, Inc. Some are available for public use, some not. Information may be obtained from:
Games Central/55 Wheeler St./Cambridge, Mass. 02138

Prepared July, 1972

# PUBLICATIONS AND GAME DESCRIPTION LIST

The following may be obtained at the prices listed from:

Service Division
Environmental Simulation Laboratory
University of Michigan
109 E. Madison
Ann Arbor, Michigan 48104
(313)-763-0258

Prices already include postage and handling.

## I. INFORMATION ON SPECIFIC GAMING/SIMULATIONS

Please note that the shorter game descriptions offer an introductory idea of what the gaming/simulation is about and how it is played, but not in-depth information.

| Title | Pages | Purchase Cost: One copy | 2-20 | 21 or more |
|---|---|---|---|---|
| A Selected List of Urban and Environmental Gaming/Simulations | 11 | free | $1.00 ea. | $.50 ea. |
| AEPS | 2 | free | .20 ea. | .10 ea. |
| C.L.U.G. | 2 | free | .20 ea. | .10 ea. |
| M.E.T.R.O.-APEX | | | | |
| Brief Description | 2 | free | .20 ea. | .10 ea. |
| Information Memorandum (Service Memo 100) | 3 | free | Not available | |
| A General Description | 76 | $3.00 | $3.00 ea. | $3.00 ea. |
| Metropolis | 2 | free | .20 ea. | .10 ea. |
| Policy Negotiations | 2 | free | .20 ea. | .10 ea. |
| SIMSOC | 1 | free | .10 ea. | .05 ea. |
| They Shoot Marbles, Don't They? | 2 | free | .20 ea. | .10 ea. |
| W.A.L.R.U.S. | 1 | free | .10 ea. | .05 ea. |
| WARD | 2 | free | .20 ea. | .05 ea. |

## II. MISCELLANEOUS ENVIRONMENTAL SIMULATION LABORATORY PUBLICATIONS

M.E.T.R.O. Project Staff, M.E.T.R.O., Report on Phase I, 1966, 70 pages plus appendix. $3.00

An early conceptual design for the complex gaming-simulation M.E.T.R.O., including some of the basic logic of the selection of roles and models to be incorporated into an early version of the computer-based urban game.



SE 014 419

Paul H. Ray and Richard D. Duke, "The Environment of Decision-Makers in Urban Gaming Simulation," 1967, 37 pages. $2.00

A discussion of the context and rationale for development of the computer-based gaming-simulation M.E.T.R.O. and a description of some of the assumptions and components of the game. The paper also describes the uses to which the builders of M.E.T.R.O. intended the game to be put and discusses research for which the game may be used.

Paul H. Ray, "Human Ecology, Technology, and the Need for Social Planning," 1968, 16 pages. $.50

Published in American Behavioral Scientist, August 1968, pp. 16-19.

Richard D. Duke, "Operational Gaming and Simulation in Urban Research," 1969, 28 pages. $1.00

An annotated bibliography.

Environmental Simulation Laboratory, "Final Report to the Ford Foundation on a Grant for Computer Equipment for Urban Research and Training," 1970, 46 pages. $2.00

A discussion of the philosophy and evolution of the M.E.T.R.O. project.

## THE ENVIRONMENTAL SIMULATION LABORATORY: HISTORY

The Environmental Simulation Laboratory first came into being in 1964 in the form of the METRO project. This project, funded by the Housing and Home Finance Agency (now Housing and Urban Development) of the U.S. Government was a joint effort of Michigan State University and the University of Michigan. Cooperating authorities at Michigan State University were the Institute for Community Development and the Department of Urban Planning and Landscape Architecture. The project was physically located at the offices of the Tri-county Regional Planning Commission in Lansing. In 1965 the project was supplemented by a grant from the Ford Foundation which was designed to assist in the development of computer techniques and urban studies.

In late 1967 the project and the staff previously identified as the Urban Regional Research Institute at Michigan State University transferred to the University of Michigan where a new unit, The Environmental Simulation Laboratory, was formed within the School of Natural Resources.

After arrival at the University of Michigan several new projects were undertaken most notable of which were those dealing with the Susquehanna River Basin for the State of New York and the U.S. Corps of Engineers, and the APEX project for the United States Office of Air Pollution as a sub-contract to the University of Southern California. This project went through four contract periods, finally terminating in August of 1971. The product of this effort, M.E.T.R.O.-APEX, a complex gaming-simulation of an urban region with an emphasis on air pollution, is now being used across the nation by over 50 American universities and is currently in use in more than a dozen foreign countries where it has been translated into two languages.

Projects currently under design or development in the Laboratory include a forest simulation, a river basin simulaton, a game simulation of the Monterey Bay region of California, a gaming-simulation of the Grand Traverse Bay area of Michigan under the Sea Grant program, a housing simulation for Germany in the City of Dortmund, a policy simulation related to low- and moderate-income housing in suburban areas, a community development game to be used by inner city residents, and a program in the development of gaming simulations for high management use by the French government. In addition, we have recently initiated a two-year program of funding from the Ford Foundation to develop and disseminate games for citizen use in urban communities. A small grant from the General Electric Foundation is used to support students in the development of games related to environmental issues. Under a grant from the National Institute of Mental Health, currently in its third year, the Laboratory provides special assistance in game design and use to faculty, students, and community groups. Because of a network of over twenty-five related staff people, the Environmental Simulation Laboratory is involved in a broad range of research on the development of new gaming simulation models in addition to applications to problem solving and educational applications.

The Laboratory is maintained by a series of research grants and is therefore dependent on these grants for its existence. In a recent reevaluation of its mission, the Laboratory staff confirmed its intention to mobilize effort toward the development of a sophisticated and effective gaming-simulation process to be used in the development of public policy in some political jurisdiction in the country. It is believed that this mission if fulfilled will demonstrate the viability of the concept of gaming-simulation which we believe to be potentially useful in management situations typified by variables which are diffuse, intangible, rapidly changing, and heavily dependent upon citizen input. In such a situation gaming-simulation is a uniquely useful planning methodology. Most of the projects currently being conducted are directed toward this mission.

SCHOOL OF NATURAL RESOURCES THE UNIVERSITY OF MICHIGAN

ENVIRONMENTAL SIMULATION LABORATORY
RICHARD D. DUKE, DIRECTOR

1049 WALLACE
ANN ARBOR, MICHIGAN 48104

MEMORANDUM: September, 1971

FROM: Mr. Larry Coppard, Coordinator, Service Division

SUBJECT: METRO-APEX INFORMATION

Cost

1. METRO-APEX Manuals and Forms
   complete set of 100 manuals and game users forms — 200.00

2. Computer Program
   2 disks IBM-1130-2B system — 180.00
   1 tape IBM 360 system — 15.00
   service charge for loading disks or tape — 100.00

3. User forms kits (includes enough consumable game materials for 50 players) — 40.00

4. Game Director's Training
   @ $50.00 per day--normal time required is 5 days — 250.00

5. Demonstration Run
   A typical run requires:
   A. 3 days
   B. 25-60 players
   C. 5 ESL staff
   D. 8-12 hours of computer time and supplies
   E. consumable game materials
   F. suitable playing space
   G. use of manuals and reference materials
   ESL's fee for this type of run at the Lab's facilities in Ann Arbor, Michigan — 2000.00

6. Out of Town Demonstration Runs
   price established in consultation with user — --

7. Consultation--perhour — 20.00

Note: Special circumstances will vary these prices. ESL wishes to encourage METRO-APEX use in all ways possible, but is required to recover any associated costs. Where possible every effort will be made to provide service to a user within his budget limitations. If you have special concerns with regard to cost contact Mr. Coppard.

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## Applications

The METRO-APEX program has been used by several major universities across the nation including Harvard, Yale, University of California, University of Michigan and the University of Southern California. It has been demonstrated for three Air Pollution Consortiums where over 15 other universities have participated. It is currently being used for advanced training by the Air Pollution Control Institute of the University of Southern California, the Law School at Harvard in urban land use control, for urban planning and resource management at the University of Michigan, as an interdisciplinary training program in law, planning, and engineering at the University of Southern California. The program is ideally suited for groups wishing to study urban phenomena, its problems and possible solutions. METRO-APEX has been translated into French and German and is in use in several places in Europe.

## Game Time Frame

The METRO-APEX game should be played for a minimum of five cycles in order for it to be a meaningful learning experience. Each cycle usually takes from 3 to 4 hours and may take up to 8 hours. There are several options for playing the game including a condensed time span, i.e., two cycles per day over two and a half days; one cycle per day; or one day a week.

## Computers

METRO-APEX is programmed in Fortran IV and runs on an IBM 1130-2B Computing System. This disk may be used with 8K working storage and larger units. A model 6 card Reader-Punch is the primary input device. Output may be either an 1132 or 1403 Printer. It will normally require 1 to 1 1/2 hours of processing time on the 1130 computing system, plus an additional 1/2 hour to 1 hour for keypunching the decisions onto computer cards, or 1 1/2 to 2 1/2 hours total. (Computing time varies depending upon the speed of the printer used.) IBM 360 capabilities are also available for IBM 36050 or larger systems.

## Game Director's Training Course

This course will be offered periodically at the Environmental Simulation Laboratory. The course will be limited to 12 students. Each student will receive instructions in game operations, computer processing, and problem analysis. Training sessions may be held at other universities by special arrangement.

## Staff

Staff requirements will vary with group size; however, a core of well trained staff members is essential. One well trained game operator with several knowledgeable role instructors (students who have previously participated in the game may serve as a role instructors reservoir) is usually sufficient. The following rules of thumb may be applied--3 staff for less than 20 players,

5 staff for 20 to 50 players and 7 staff for 50 to 100 players. Needless to say, the better the staff the more satisfactory the learning experience becomes. Approximately 50 players is an optimal size group.

Consumable Supplies

Consumable supplies may be ~~obtained at minimal cost from ESL.~~ copied by you. These supplies include student worksheets used to record player's decisions, work-maps, and coding sheets.

Replacement Manuals

Student Manuals do wear out and must be replaced. ESL has replacement manuals available for users at reasonable cost.

Game Room Space Requirements

A game room of approximately 20 square feet per player is needed. The room should have at least 5 sets of tables (one for each role) of sufficient size to accommodate the computer printout and other work materials. It is preferable to keep the students together in one room during the period of play. However, other facilities such as closed circuit television, moot court rooms, etc,, can be used for supplemental training.

Demonstrations

The METRO-APEX game is available for demonstration runs. These are usually run over a 2 1/2-3 day intensive session. ESL will supply staff, manuals, supplies and a computer operator. The host institution should supply computer time, keypunch, computer supplies, meeting rooms, travel expenses, and students.

Special Assistance During Play

ESL will supply technical assistance to operating users at $20.00 per hour plus travel.

Update

Revised versions of the game are released periodically. Please drop a note if you would like to be informed about future releases.

LC/drm

M.E.T.R.O.-APEX

Developed by the Environmental Simulation Laboratory

The most complex game of the M.E.T.R.O. series to date, M.E.T.R.O.-APEX focuses on the interplay of private and public-sector budgeting decisions with exogenously-induced economic fluctuations, and the consequences of this interplay on the physical and economic development of the metropolitan area. A participant in the game assumes one of five basic roles, public sector roles being those of Politician, Planner, Air Pollution Control Officer, with Land Developers and Industrialists representing the private sector.

The Politician role is that of an elected representative of a particular constituency within his jurisdiction. Provision is made for up to 8 Politician roles, with players forming both a city council and county board of supervisors. With the exception of votes on public policy issues, which are made separately by each Politician, all decisions of the "County Board" or "City Council" must be made jointly. Since each Politician represents a specific electoral district, the constituency of which may have different socio-economic characteristics, bargaining may be called for between Politicians in order to reach joint decisions. Each Politician must stand for re-election from his district every two years.

The decisions of the County Board and City Council focus on the budget as a major tool for defining and implementing policy. Both the raising of revenues for annual operating expenses of government and the expenditures of funds across a range of government activities are major concerns. In addition to the operating budget, which may include special programs which cross normal agency lines, Politicians are concerned with the provision of miscellaneous public buildings, and with financing these projects, often through the issuance of general obligation and revenue bonds. Information from the simulated environment regarding population shifts, the condition of public capital facilities, and the percentage of the population which is poor or unemployed, is made available in the computer output given to the Planner each cycle and may guide the Politician's decisions.

The Planner's role focuses primarily on the formulation of a capital improvement program and on recommendations for special programs for the Politicians' consideration in the following cycle, or year, when drawing up their budgets. The Planner also advises the Politicians on land use decisions such as the attraction of a new industry to town and rezoning applications submitted by the Developers. The Planner may recommend rezoning on his own initiative, if he desires, to further his planning goals, but must convince the Politicians to grant the rezoning. Since the Planner has no power to make binding decisions, his success depends heavily on his persuasive abilities. Two Planner roles are provided in the game, the City Planner performing these functions for the Central City and a County Planner for the rest of the area included in the game.

The Air Pollution Control Officer (APCO) is responsible for overseeing the air quality of the area represented in the game. He will be seeking funds, both County and Federal, to inspect industrial plants, measure emissions from these plants, and establish and operate air quality monitoring stations in various parts of the metropolitan area. He reports to the County Politicians and must receive from them the legislative authority for setting and enforcing air pollution emission standards.



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There may be up to seven Developers in the game, each operating identically, although their initial property holdings and financial assets are different. Developers are concerned with buying, developing and selling real property. In order to make their decisions sensibly, they will have to estimate demand for particular types of developed property and projected profit-margins for each. Developers may deal in several density-price classes of single- and multiple-family residential land uses, local and regional shopping facilities and local (light) industry.

Like the Developers', the Industrialists' roles are very similar to one another, although the differences in their industrial operations allow some variation in the specific components of their roles. Five industries are currently operable in the game. In seeking profits from their operations, the Industrialists may set their production levels, their estimated sales and, with the exception of the publicly-regulated power plant, their sales prices. Sales will depend upon the competitiveness of the asking price, as determined by a simulated market. Since industry is a major contributor to air pollution, the Industrialist may at some point also have to invest in pollution control equipment or change fuel to meet legal emission standards enforced by the APCO.

M.E.T.R.O.-APEX, then, contains a total of 23 distinct roles: 1) Politicians -- 3 Central City, 5 County; 2) Planners -- 1 Central City, 1 County; 3) APCO; 7 Developers; 5) 5 Industrialists. Fewer people can be accommodated by reducing the number of players in multiple-player roles (Politicians) and the number of Developers and/or Industrialists. Additonal players can be added to the latter two roles and to the Planner and APCO roles to accommodate larger numbers of players. Additional roles, not as structured as those previously identified, may also be added to accommodate larger numbers of players or to help illustrate particular community needs or functions. Such ad hoc roles include those of Newspaperman, Regional Planners, and City and County Finance Officers. Approximately 4 - 5 hours should be reserved for each cycle of play.

## SOME SUGGESTED REFERENCE BOOKS FOR USE DURING PLAY OF M.E.T.R.O.-APEX

Area Development Department, Consumers Power Company (Jackson, Michigan). Data on Lansing, Michigan. 1963.

Includes 1963 data on population, employment, industries, earning levels, labor organizations, labor relations, freight transportation, passenger transportation, utilities, local services, taxes, and site data.

Duke University School of Law. Law and Contemporary Problems: Air Pollution Control. Spring, 1968 (XXIII,2) issue of the journal. Address all communications to: Law and Contemporary Problems/Duke Station/Durham, North Carolina 27706.

Office of Economic Opportunity. Catalog of Federal Domestic Assistance. April 1970. 1034 pages. For sale by the Superintendent of Documents/U.S. Government Printing Office/Washington, D. C. 20402.

"A description of the Federal government's domestic programs to assist the American people in furthering their social and economic progress. Explains nature and purpose of programs, specifies major eligibility requirements, tells where to apply, lists printed materials available."

Stern, Arthur C., ed. Air Pollution (Second Edition). New York and London: Academic Press (111 Fifth Ave./N.Y. 10003; Berkely Square House, London W.1), 1968. Three volumes.

Concerned with the cause, effect, transport, measurement, and control of air pollution.
Volume I: Air Pollution, Air Pollution Meteorology, Effects of Air Pollution.
Volume II: Analysis of Pollutants, Air Quality and Meteorological Monitoring, Source Measurement and Community Survey.
Volume III: Sources of Air Pollution, Control Methods and Equipment, Air Polluton Control.

Tri-County Regional Planning Commission. Growth and Change: Preliminary Development Proposals for the Tri-County Region. A booklet prepared November 1965 by the Planning Commission (535 N. Clippert/Lansing, Michigan 48912).

U.S. Department of Health, Education, and Welfare. Guidelines for the Development of Air Quality Standards and Implementation Plans. May, 1969. Available from: HEW/Public Health Service/Consumer Protection and Environmental Health Service/ National Air Pollution Control Administration/Washington, D.C.

Requirements of the Air Quality Act of 1967, recommendations for prompt and effective implementation, and federal assistance guide.

Urban-Regional Research Institute (Michigan State University). Lansing Area Profile: Statistical Portrait of a Progressive Industrial Metropolis. Prepared for the Lansing Metropolitan Development Authority/123 West Ottawa St./Lansing, Michigan 48901/(517)-482-1587. 128 pages.

General characteristics, living conditions, local government, finance, utilities, industrial resources, communication and transportation, bibliography.